United States Department of Agriculture

RESOURCE UPDATE FS-152

FORESTS OF North Carolina, 2016

This resource update provides an overview of forest resources in North Carolina based on an inventory conducted by the U.S. Forest Service, Forest Inventory and Analysis (FIA) program at the Southern Research Station in cooperation with the North Carolina Forest Service. Data estimates are based on field data collected using the FIA annualized sample design and are updated yearly. The estimates presented in this update are for the measurement year 2016 with comparisons made to data reported in 2013 (the latest 5-year analytical report for the State). The sample plot population in North Carolina consists of 5,800 plots distributed across the State, of which approximately 15 percent are collected annually from a 7-year cycle. The 2016 estimates represent a full cycle updated by 3 years of new data since 2013 to produce the updated estimates. Growth, removals, and mortality (GRM) estimates were derived from remeasurement data on 5,662 of the plots. The slightly smaller sample used for GRM estimates include all successfully revisited and remeasured plots. The data used in this publication were accessed from the FIA database on November 24, 2017.

Overview

North Carolina is home to 18.81 million acres of forest land (table 1). Forest land includes areas designated as reserved, whereas timberland is that portion, 18.13 million acres, not restricted from commercial timber production. The majority of this report is focused on timberland. The number of live trees on North Carolina's timberland in 2016 was estimated at 14.47 billion trees, an increase of <1 percent from 2013. Net volume increased <7 percent to 40.89 billion cubic feet. Average annual net growth increased 3 percent to 1.63 billion cubic feet, whereas average annual removals decreased by <5 percent since 2013 to 0.88 billion cubic feet (table 1).

Table 1—North Carolina forest statistics, change between 2013 and 2016[a]

Forest statistics	2013 estimate	Sampling error (percent)	2016 estimate	Sampling error (percent)	Change since 2013
Forest land					
Area *(thousand acres)*	18,610.7	0.61	18,808.0	0.60	197.3
Number of live trees ≥1.0 inch d.b.h. *(million trees)*	14,828.1	1.53	14,823.2	1.49	-4.9
Net volume of live trees ≥5.0 inches d.b.h. *(million cubic feet)*	40,142.7	1.31	42,723.3	1.25	2,580.6
Live tree aboveground biomass *(thousand oven-dry tons)*	990,476.7	1.16	1,044,532.6	1.11	54,055.9
Net annual growth of live trees ≥5.0 inches d.b.h. *(million cubic feet per year)*	1,602.7	2.13	1,645.8	1.89	43.1
Annual removals of live trees ≥5.0 inches d.b.h. *(million cubic feet per year)*	917.3	5.53	878.0	5.50	-39.3
Annual mortality of live trees ≥5.0 inches d.b.h. *(million cubic feet per year)*	347.0	4.66	364.9	4.17	17.9
Timberland					
Area *(thousand acres)*	17,887.9	0.68	18,128.0	0.67	240.1
Number of live trees ≥1.0 inch d.b.h. *(million trees)*	14,443.1	1.57	14,469.6	1.54	26.5
Net volume of live trees ≥5.0 inches d.b.h. *(million cubic feet)*	38,353.2	1.36	40,891.6	1.30	2,538.4
Live tree aboveground biomass *(thousand oven-dry tons)*	947,796.0	1.22	1,000,709.3	1.17	52,913.3
Net annual growth of live trees ≥5.0 inches d.b.h. *(million cubic feet per year)*	1,583.9	2.14	1,632.7	1.89	48.8
Annual removals of live trees ≥5.0 inches d.b.h. *(million cubic feet per year)*	921.8	5.52	876.8	5.50	-45.0
Annual mortality of live trees ≥5.0 inches d.b.h. *(million cubic feet per year)*	321.9	4.92	340.6	4.35	18.7

[a] Estimates for 2016 represent a full sample comprised of plots from eight panels (2009, 2010, 2011, 2012, 2013, 2014, 2015, and 2016), of which 45 percent are new data. The 2013 estimates used were reported in Resource Update FS-47.

Forest Area

North Carolina is divided into four survey units (fig. 1). The total timberland in all survey units is 18.13 million acres. The Piedmont unit contained the largest portion with 5.45 million acres, or 30 percent (table 2). The Southern Coastal Plain had 28 percent, the Mountains 22 percent, and the Northern Coastal Plain almost 20 percent of the timberland.

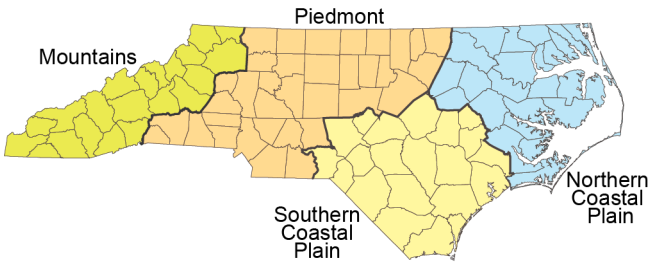

Figure 1—Forest survey regions in North Carolina.

Private individual ownerships accounted for most timberland with 10.99 million acres, or <61 percent (table 2). Other corporate ownerships combined for <21 percent, national forests for 6 percent, State/local governments for 6 percent, forest industry for <5 percent, and other Federal for <2 percent of the timberland.

The largest portion of private individual ownerships, 37 percent, were located in the Piedmont. The Northern Coastal Plain contained the largest portion, 59 percent, of the forest industry timberland. The Mountains contained most, 80 percent, of the national forest timberland.

The oak-hickory forest-type group dominated with 6.90 million acres, or 38 percent, of all timberland (table 3). The loblolly-shortleaf pine forest-type group covered 32 percent, the oak-pine forest-type group 13 percent, and the oak-gum-cypress type group 9 percent of the timberland. The largest portion of the oak-hickory forest types, 44 percent, was located in the Mountains, and the Piedmont contained another 39 percent (table 3).

The Southern Coastal Plain contained the largest portion, 41 percent, of the loblolly-shortleaf pine forest types, and the Northern Coastal Plain contained another 30 percent. More of the oak-pine forest types, 34 percent, occurred in the Piedmont, and another 28 percent in the Southern Coastal Plain unit. Most, 49 percent, of the oak-gum-cypress forest types were in the Southern Coastal Plain unit, and 45 percent were in the Northern Coastal Plain unit.

Planted stands accounted for 18 percent, or 3.29 million acres, of the timberland (table 4). The Southern Coastal Plain contained >40 percent of the planted acres, the Northern Coastal Plain >34 percent, the Piedmont 23 percent, and 2 percent were in the Mountains.

Table 2—Area[a] of timberland by ownership and survey unit, North Carolina, 2016

Category	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Mountains	State
			million acres		
National forest	0.04	0.11	0.09	0.91	1.14
Other Federal	0.23	0.04	0.05	0.00	0.32
State and local government	0.42	0.21	0.27	0.16	1.06
Forest industry	0.22	0.51	0.11	0.03	0.87
Individual	2.72	1.94	4.10	2.23	10.99
Other corporate	1.52	0.79	0.83	0.61	3.75
Total	5.14	3.60	5.45	3.94	18.13

[a] Sum of components and totals may differ due to rounding.

Table 3—Area[a] of timberland by forest-type group and survey unit, North Carolina, 2016

Forest-type group	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Mountains	State
			million acres		
White-red-jack pine	0.00	0.00	0.00	0.10	0.10
Spruce-fir	0.00	0.00	0.00	0.02	0.02
Longleaf-slash	0.38	0.03	0.00	0.00	0.41
Loblolly-shortleaf[b]	2.36	1.74	1.57	0.12	5.79
Oak-pine	0.65	0.44	0.78	0.44	2.31
Oak-hickory	0.74	0.44	2.69	3.03	6.90
Oak-gum-cypress	0.81	0.75	0.11	0.00	1.67
Elm-ash-cottonwood	0.13	0.14	0.26	0.03	0.56
Maple-beech-birch	0.00	0.00	0.00	0.06	0.06
Other hardwoods[c]	0.00	0.00	0.01	0.12	0.14
Nonstocked	0.07	0.05	0.04	0.01	0.17
Total	5.14	3.60	5.45	3.94	18.13

[a] Sum of components and totals may differ due to rounding.
[b] Includes other eastern softwoods.
[c] Includes aspen/birch and exotic hardwoods.

Table 4—Area[a] of timberland by stand origin and survey unit, North Carolina, 2016

Stand origin	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Mountains	State
			million acres		
Planted	1.33	1.13	0.77	0.07	3.29
Natural	3.81	2.47	4.69	3.87	14.84
Total	5.14	3.60	5.45	3.94	18.13

[a] Sum of components and totals may differ due to rounding.

Volume, Biomass, and Trends

North Carolina timberland contained 40.89 billion cubic feet of total wood volume. Hardwood species comprised 26.16 billion cubic feet, or 64 percent, of the total inventory (table 5). Softwood species comprised 14.73 billion cubic feet, or 36 percent, of the total volume in the State. Total softwood inventory was highest (35 percent) in the Southern Coastal Plain, and least (12 percent) in the Mountains unit. Total hardwood inventory was highest (39 percent) in the Mountains, and least (13 percent) in the Northern Coastal Plain.

Statewide, net growth of softwoods averaged 881.0 million cubic feet annually (table 5). Most of the softwood net growth, 40 percent, came from the Southern Coastal Plain. Another 29 percent came from the Northern Coastal Plain. The State averaged 548.5 million cubic feet of softwood removals annually, with 39 and 34 percent from the Northern and Southern Coastal Plain units, respectively. The softwood growth to removals ratio was highest (2.0) in the Piedmont, and least (0.9) in the Mountains unit, where successive increased mortality from hemlock demise has lowered the ratio.

Table 5—All-live volume[a] of net growth, removals, and total inventory for softwoods and hardwoods by survey unit, North Carolina, 2016

Category	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Mountains	State
	million cubic feet				
Softwood					
Net growth	352.3	257.2	241.3	30.3	881.0
Removals	184.1	212.5	118.8	33.1	548.5
G/R ratio[b]	1.9	1.2	2.0	0.9	1.6
Total inventory	5,207.9	3,506.5	4,271.3	1,761.6	14,731.4
Hardwood					
Net growth	127.9	102.5	302.4	218.8	751.6
Removals	85.7	73.6	123.2	45.8	328.3
G/R ratio[b]	1.5	1.4	2.5	4.8	2.3
Total inventory	3,635.9	3,372.3	8,939.1	10,212.9	26,160.2
All species					
Net growth	480.2	359.8	543.7	249.1	1,632.7
Removals	269.8	286.1	242.0	78.9	876.8
G/R ratio[b]	1.8	1.3	2.2	3.2	1.9
Total inventory	8,843.8	6,878.7	13,210.4	11,958.7	40,891.6

[a] Sum of components and totals may differ due to rounding.
[b] Net growth/removals ratio.

The State's net growth of hardwoods averaged 751.6 million cubic feet annually. Most of the hardwood net growth, 40 percent, came from the Piedmont unit. Another 29 percent came from the Mountains unit. The State's hardwood removals averaged 328.3 million cubic feet annually. Most of the hardwood removals, 38 percent, came from the Piedmont unit. The hardwood growth to removals ratio was highest (4.8) in the Mountains unit and least (1.4) in the Northern Coastal Plain unit.

Biomass totaled 1,000.71 million tons in North Carolina. Hardwood species comprised 689.34 million tons, or 69 percent, of total biomass (table 6). Softwood species comprised 311.37 million tons, or 31 percent, of total biomass.

The Southern Coastal Plain contained the largest portion (36 percent) of the softwood biomass. The Mountains contained the largest portion (38 percent) of the hardwood biomass.

Table 6—Aboveground biomass and carbon estimates[a] on timberland for softwoods and hardwoods by survey unit, North Carolina, 2016

Category	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Mountains	State
	million tons				
Softwood					
Biomass	113.38	74.96	91.88	31.14	311.37
Carbon	56.69	37.48	45.94	15.57	155.69
Hardwood					
Biomass	102.47	90.85	235.76	260.26	689.34
Carbon	51.24	45.43	117.88	130.13	344.67
Total					
Biomass	215.85	165.80	327.64	291.41	1,000.71
Carbon	107.93	82.90	163.82	145.71	500.36

[a] Sum of components and totals may differ due to rounding.

Bottomland hardwoods. (photo by Brian Lockhart, USDA Forest Service, Bugwood.org)

Bottomland Forest Trends in North Carolina

In 2016, bottomland forests (based on hydric and narrow/broad floodplain physiographic classes) classified as timberland covered 2.39 million acres in North Carolina, down 36 percent from the 3.76 million acres it occupied at the time of the 1974 inventory (table 7). However, the largest decline occurred between 1974 and 1984 where it dropped by 17 percent. Area of bottomland forest has plateaued since 2007.

Following changes in area, the total number of bottomland trees decreased from 3.22 billion trees in 1974 to 1.63 billion trees in 2016, down 49 percent. The largest decline in number of trees occurred between 1974 and 1984 where it dropped by 0.66 billion trees. However, the decrease in number of trees has slowed since 2002.

Net volume decreased to a lesser extent, by 11 percent from 6.19 billion cubic feet in 1974 to 5.49 billion cubic feet in 2016. Hidden in this change, net volume actually gained between 1974 and 1990. Subsequently, however, net volume decreased most between 1990 and 2002, where it dropped by 17 percent. Since 2007, net volume has slowly risen.

Table 7—Changes in bottomland forest timberland by year, North Carolina, 1974–2016

Year	Area of bottomland forest	Number of live trees ≥1 inch d.b.h.	Net volume of live trees ≥5 inches d.b.h.
	million acres	*billion trees*	*billion ft³*
1974	3.76	3.22	6.19
1984	*3.11*	2.56	6.30
1990	2.97	2.17	6.66
2002	2.60	1.73	5.55
2007	2.37	1.69	5.23
2013	2.39	1.66	5.38
2016	2.39	1.63	5.49

Source: EVALIDator, accessed online November 24, 2017.

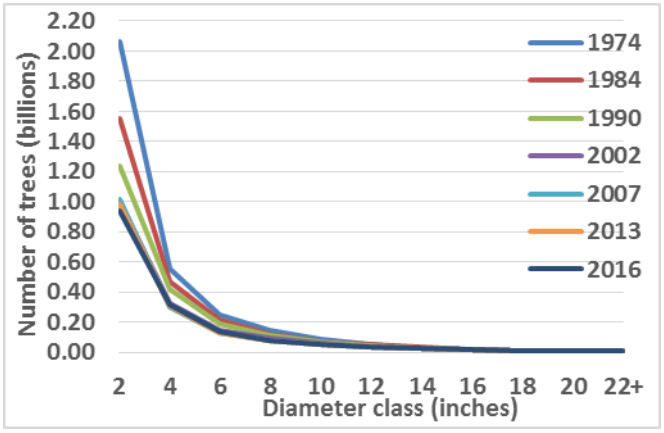

Figure 2—Number of bottomland trees ≥1 inch diameter class on timberland, North Carolina, 1974–2016.

Figure 2 shows change in number of bottomland trees by diameter class distribution over time. Graph lines depict most reductions in tree numbers occurred between 1974 and 2002, and become undetectable afterwards. However, still evident from the graph was that most of the decrease in tree numbers took place in the smaller trees, particularly those below the 10– inch diameter class. This relationship potentially correlates with the volume changes in table 7.

Bottomland forest. (photo by Brian Lockhart, USDA Forest Service, Bugwood.org)

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